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THE GENUS *JUNONIA* IN THE WEST INDIES (LEPIDOPTERA, NYMPHALIDAE)

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The genus *Junonia* is represented in the New World by a single compact group of forms, itself only a minor segregate of one of the Old World groups (Forbes, 1947; Munroe, 1949; Eliot, 1949). Within the limits of the American group, however, there is a complex pattern of individual, local, and other variation, which is very hard indeed to resolve into a clear scheme of classification. The main outlines of this variation have been discussed by Forbes (1928), but he gave detailed attention to only a few of the West Indian populations. Certain aspects of the West Indian situation have been studied by Bates (1935), by Carpenter and Lewis (1943), and by Comstock (1944); in all these cases, however, the authors were interested principally in the fauna of a restricted island group and consequently gave emphasis to the local, rather than to the general, picture.

Most workers agree that three main forms of *Junonia* can be recognized in West Indian material. Each one of these represents a series of comparable forms which is widely distributed on the mainland. The three series can be characterized as follows:

1. Forms with the posterior eye spot of the forewing above provided with an external fuscous ring, and with the anterior eye spot of the hind wing above with the pupil strongly and unsymmetrically scaled with pale violet: on the inner margin of this scaling a red semicircle forms an integral part of the pupil, apparently replacing the black of the inner ring in this region. A representative form is *coenia* Hübner.

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2. Forms with the posterior eye spot of the forewing above consisting of a single black ring surrounding a central blue spot, and with the pupil of the anterior eye spot of the hind wing often symmetrical and always lacking a red element. The pale postmedial fascia of the forewings is little constricted in cell M_2 , the wings are not unusually elongate in the antero-posterior axis, and the eye spots are relatively well developed on the under side of the hind wings. *Zonalis* Felder is a characteristic form of this series.

3. Forms similar to those described in 2 above but having the antero-posterior axis of both forewings and hind wings proportionally longer and the outer margin of the forewings more strongly excavated, so that the wings appear generally longer and narrower. The pale fascia of the forewing tends to be strongly constricted by a distal prolongation of the dark ground color in cell M_2 , and the eye spots on the under side of the hind wing are usually obsolescent. This series is typified by *genoveva* Cramer.

Authors have differed in their interpretation of the relationships of these forms. Forbes lists *coenia* as a subspecies and considers that the *zonalis*-like and *genoveva*-like forms represent seasonal phases. Carpenter and Lewis adopt an essentially similar view. Bates treats *coenia* and *zonalis* as distinct species. Comstock gives *coenia*, *zonalis*, and *genoveva* as subspecies of *evarete* Cramer, but states, "Locally, in Porto Rico, *genoveva* is distinct from *zonalis* and satisfies the conditions, superficially at least, for a species."

Briefly stated, the facts appear to be as follows. The *coenia*-like forms have their metropolis in North America and are in the main allopatric to the *zonalis* and *genoveva* series, which are characteristically Central and South American. Overlapping occurs regularly in Cuba, where *coenia* does not intergrade with the other forms, and in northern Mexico, where specimens with intermediate characters seem to be of fairly frequent occurrence. The *zonalis* and *genoveva* series occur side by side through most of Central America, South America, and the West Indies. There is conspicuous geographic variation in both series, but the essential characters which separate them are preserved, and the two types are recognizable throughout the range, except in a few areas where one or the other is absent. There is a general parallelism between the geographical variation patterns of

the two series; in particular the transition from the brown to the iridescent green forms is made at about the same region in both (see the map given by Forbes, 1928). In the finer details of the geographic variation the correspondence is not always so good. Thus in the West Indies the *zonalis* forms show conspicuous geographic differences, whereas the *genoveva* forms, except in Barbados, do not. The differences in the *zonalis* series lie, however, in the size of the eye spots and in the degree of orange suffusion of the pale fasciae. In the *genoveva* forms the eye spots are uniformly much reduced and the pale fasciae heavily suffused with orange. It is conceivable, therefore, that corresponding genetic differences might exist in this series but be below the threshold for phenotypic expression.

The differences between the *zonalis* and *genoveva* series are exactly similar to those that separate wet and dry season forms in the Old World species of *Junonia*. In the New World there is frequently some correlation with season in the appearance of the forms, but this is usually only partial and sometimes unrecognizable. The two forms may occur at the same time but in different habitats, as noted by Forbes in Guiana, by Carpenter and Lewis for the Caymans, and by Beatty in St. Croix (according to a personal communication from Dr. Forbes). The same authorities have noted a difference in activity between the forms, the *genoveva*-like ones flying more strongly and more readily than those of the *zonalis* series. This was confirmed in my own rather small field experience with these forms in the West Indies and British Guiana. Somewhat similar differences in habits and habitat preference are said to exist between the two seasonal forms of the African *Junonia* (*Precis octavia*).

With regard to the status of the two forms in the West Indies, some further information can be given. In general the *zonalis*-like forms are much more common, but small numbers of the *genoveva* type also occur in most of the islands. The collections available are not sufficiently large or representative to show more than very gross differences in the proportional incidence of *genoveva* in the various islands. In the Bahamas, however, *genoveva* is dominant, although *zonalis* occurs on at least some of the islands. In Barbados the situation is similar, *genoveva*-like or transitional individuals comprising most of the population. In the main chain of the Lesser Antilles, on the other

hand, the position is reversed: here *zonalis*-like forms are overwhelmingly dominant; *genoveva* has been taken on St. Croix, and has been recorded by Forbes from Grenada, but is not known to me from the intervening islands, where forms of the *zonalis* series are abundant. In the West Indies as a whole, the two forms do not seem to be so clearly demarcated as has been suggested by some authors. I examined minutely about 80 specimens in the Museum of Comparative Zoölogy with Comstock's (1944) diagnosis in hand and found that a number showed one or more intermediate characters and could not be placed with confidence. The three characters of wing shape, configuration of the postmedial fascia, and development of the eye spots on the under side are to some extent independent in their variation, and individuals which are *genoveva*-like in one character may be *zonalis*-like in another. The available material of the *genoveva* series is insufficient to show any possible correlation with season; in many islands, however, *zonalis*-like forms occur in all months of the year.

My own belief, based on analogy with the seasonal variation of the related Old World forms and on the intergradation, geographic distribution (coextensive, except in very dry islands, where *zonalis* is rare, or in very wet islands, where *genoveva* is suppressed), and parallel geographic variation of the *zonalis* and *genoveva* series, is that the differences between the two have an environmental rather than a genetic basis—that they represent, in fact, "wet" and "dry" forms of a single species of insect. It is true that the correlation of the appearance of the forms with the change of seasons (as determined from the calendar) is not good, but this condition is exactly paralleled in the wet and dry forms of a number of other New World butterflies, including at least one (*Eurema proterpia-gundlachia*) in which the seasonal basis of the forms is supported by very strong evidence (Lichy, 1943). The irregularity of the appearance of seasonal forms in the New World tropics is not surprising when it is remembered that the wet and dry seasons themselves are not so sharply demarcated as they are, for instance, in India or Africa. Both the total rainfall and its seasonal distribution may vary enormously in the West Indies between localities separated by only a few miles. In the Paleotropics, on the other hand, the same seasonal periodicity often rules over large areas. The tendency in the West Indies would therefore be for

wet and dry forms to be produced simultaneously in neighboring localities where the seasonal rainfall pattern differs, so that mixed populations may be found when the winged stage is reached. In the Old World, especially in South and East Africa and the monsoon areas of Asia, the relative uniformity of the seasonal pattern allows large, pure populations of the respective forms to be produced at the appropriate seasons. Experimental proof of the environmental determination of the differences between the *zonalis*-like and *lavinia*-like forms is, of course, lacking, and it is to be hoped that some of the many lepidopterists who are now active in tropical America will soon attempt to supply it.

The situation with respect to the *coenia* series is different but also contains elements of uncertainty. There is no doubt whatever that the difference between the *coenia* and the *zonalis-genoveva* series is genetic. The two series are in the main allopatric, but coexist in Cuba without intergradation and in Mexico with some apparent intergradation. They clearly act as separate species in Cuba. On the mainland, while natural hybridization evidently takes place, we do not yet have enough information to say that there is free interbreeding between the two series in their border zone; the narrowness of the zone in which intermediate characters are found would in fact tend to indicate the reverse. I therefore intend to consider *evarete* (the oldest valid name for the *zonalis-genoveva* complex) and *coenia* as distinct species. Should satisfactory evidence of free interbreeding of the two forms in their Mexican zone of contact subsequently be presented, it will be necessary to revise this arrangement and to consider all the subspecies as members of a single "rassenkreis," with two outlying populations preserving their integrity in the Cuban zone of overlap. The latter arrangement has in effect been adopted by Forbes (1928).

I am inclined to follow Forbes in treating *vestina* as a distinct species. It appears from Forbes' account, however, to be wholly allopatric to *evarete*, and it differs from that species in characteristics that would be expected in an alpine form, notably in the reduced total size. I think, therefore, that the relationships of the two forms merit further investigation. I have examined the male genitalia of *vestina* and am unable to distinguish them from those of the other New World forms.

At present, then, I recognize three New World species of

Junonia, of which two, *evarete* and *coenia*, occur in the West Indies. I wish to emphasize, however, that this arrangement is purely tentative and that only in the case of the Cuban populations of *coenia* and *evarete* has the existence of a functional species difference been clearly demonstrated. In the West Indies *evarete* is universally distributed, while *coenia* is restricted to Cuba and perhaps the Bahamas.

Junonia coenia Hübner

Junonia coenia HÜBNER, 1822, vol. 2, pl. 32.

Well established in Cuba, where a single subspecies occurs. Forbes (1928, p. 316) records *coenia* from Nassau, but I have seen no specimens from the Bahamas, and it is not certain that the Cuban subspecies occurs there.

Junonia coenia coenia Hübner

Junonia coenia HÜBNER, 1822, vol. 2, pl. 32.

Vanessa coenia, POEY, 1852, p. 197.

Junonia genoveva, GUNDLACH, 1881, p. 65 [misdetermination].

Precis lavinia coenia, SEITZ, 1914, p. 461, pl. 94.

Junonia coenia, HOLLAND, 1916, p. 492.

Junonia lavinia coenia, FORBES, 1928, p. 306.

Precis coenia, BATES, 1935, p. 167.

Junonia evarete coenia, COMSTOCK, 1944, p. 453, pl. 6.

This form is easily recognized by the characters given in the general discussion above. Comstock was able to match Hübner's figures with Cuban specimens and has restricted the type locality to that island. He believes the North American populations to be subspecifically distinct from the Cuban one but has not described the differences. Cuban specimens are ordinarily smaller than those from the mainland, but I have not directly compared enough specimens to feel able to add to Comstock's remarks.

The species occurs at low altitudes in Cuba and seems to be more abundant in the central and western parts of the island than in the east. It has, however, been taken at Guantánamo (Museum of Comparative Zoölogy). It was recorded by Holland and by Bates from the Isle of Pines; there are 34 specimens from that island in the Carnegie Museum, and Bates says that there are also specimens in the United States National Museum. Forbes records *coenia* from Nassau, but I have seen no speci-

mens from the Bahamas. Material from the northern Bahamas might conceivably belong to a continental, rather than to the Cuban, subspecies.

The life history is well known; in North America the larva feeds on *Ludwigia*, *Plantago*, and various Scrophulariaceae. No host plant records are available from the West Indies.

MATERIAL EXAMINED: Seventy-three specimens from Cuba and the Isle of Pines, all from altitudes under 1000 feet, in the American Museum of Natural History, the Carnegie Museum, and the Cornell University collections.

Junonia evarete (Cramer)

Papilio lavinia CRAMER, 1775, vol. 1, p. 32, pl. 21 (not Fabricius).

Papilio evarete CRAMER, 1779, vol. 3, p. 18, pl. 203.

Comstock (1942, 1944), has shown that *Papilio lavinia* Cramer, 1775, is a homonym of *Papilio lavinia* Fabricius, 1775, and that consequently the less familiar name *evarete* Cramer must be used for this species. Fortunately the two names refer to the same subspecies (see Forbes, 1928), so that no further substitution is involved.

This species, abundant throughout the Neotropical region, presents an extremely complex pattern of local and individual variation in the continental part of its range. Since two of the continental subspecies enter the Antillean area, it will be necessary to give here a brief summary of the geographical variation on the mainland. In general there are two main series of subspecies, called by Forbes "central forms" (as distinguished from the northern *J. coenia*) and "southern forms." *J. evarete zonalis*, which may be considered typical of the more northerly series, is small, rather crisply marked, has no perceptible iridescence, and is of a moderately dark brown, usually with little tawny shading except in the postmedial fascia. The "dry" form is of the same general coloration as the "wet." The most widely distributed subspecies of the southern group is, according to Forbes, *J. evarete hubneri*. In the typical "wet" form of this subspecies the size is usually large and the ground color very dark, with a strong green iridescence. In the corresponding "dry" form (*pallens*), figured by Holland (1898) as "*lavinia*," the wings are strongly falcate and the ground color is much paler, hardly contrasting with the postmedial fascia;

the green iridescence, however, usually persists. The Peruvian *J. e. lima* and *J. e. huacapistana* seem to be local segregates of the *hübneri* stock. According to Forbes' map the northern and southern series meet along a sinuous east-west line, centered approximately on the Equator. In the Guianas, however, type locality for the Cramer names, the populations are typical of neither the northern ("central") nor the southern series. Instead, two additional subspecies are found, one characteristic of the coast lands, the other characteristic of the inland savannas. The former appears to have been the one described by Cramer under the names *lavinia*, referring to a "wet," *evarete*, referring to an intermediate, and *genoveva*, referring to a "dry," individual. The name *Junonia evarete arenosa* (Forbes) applies to the savanna subspecies. *J. evarete evarete* is on the average larger and paler than typical *zonalis*; there is often a pronounced tawny shading, especially in the "dry" form; most specimens have no green iridescence.

In the West Indies three subspecies can be recognized. *Junonia evarete zonalis*, which on the mainland has a continuous range from Mexico to Venezuela and Trinidad, occurs in the Greater Antilles as far east as Hispaniola. In Puerto Rico a second somewhat similar subspecies occurs, which extends with little change through the Virgin Islands and Lesser Antilles. Although the change between Hispaniola and Puerto Rico is abrupt, material from the southernmost Lesser Antilles shows signs of intergradation to true *zonalis*, which is reëncountered in Trinidad. In Barbados a surprising thing happens. The population of that island is not of the *zonalis* type at all, the specimens being larger, paler, and much more tawny. They probably fall within the range of variation of *J. evarete evarete* and are here referred to that subspecies.

The West Indian situation is thus reasonably straightforward. The Puerto Rican-Lesser Antillean subspecies undoubtedly represents an endemic and fairly recent segregate from the main population of *zonalis*. This may have developed locally in Puerto Rico and subsequently have colonized the Lesser Antilles, or it may have been a general Greater Antillean subspecies which has now been supplanted by fresh incursions of *zonalis* in the more westerly islands. On theoretical grounds it is unlikely that the subspecies arose in the Lesser Antilles and replaced a population of *zonalis* in Puerto Rico. The presence

of a distinct population of Guianian type in Barbados is at first sight anomalous. Dr. Forbes has, however, suggested to me the possibility that the species may have been introduced to Barbados by human agency. Barbados is an outlying island and has only a few species of butterflies. There may well have been no native population of *evarete*. For several hundred years shipping has traveled between Barbados and the Guianas, and an accidental introduction from a Guianian source is a reasonable possibility.

Junonia evarete zonalis (C. and R. Felder)

- Vanessa genoveva*, POEY, 1852, p. 197.
Junonia lavinia, LUCAS, 1857, p. 545.
Junonia zonalis C. AND R. FELDER, 1867, p. 399.
Junonia incarnata C. AND R. FELDER, 1867, p. 399.
Junonia constricta C. AND R. FELDER, 1867, p. 399.
Junonia lavinia, GUNDLACH, 1881, p. 64.
Junonia lavinia var. *genoveva*, MÖSCHLER, 1886, p. 27.
Junonia genoveva, FOX AND JOHNSON, 1893, p. 3.
Junonia genoveva, SWAINSON, 1901, p. 79.
Precis lavinia, LONGSTAFF, 1908, pp. 38, 40, 43.
Junonia lavinia genoveva, HALL, 1925, p. 187.
Junonia lavinia, KAYE, 1926, p. 469.
Junonia lavinia coenia, KAYE, 1926, p. 469.
Junonia lavinia zonalis, FORBES, 1928, p. 307 (in part).
Junonia lavinia zonalis f. *genoveva*, FORBES, 1928, pp. 308, 309.
Junonia lavinia zonalis f. *constricta*, FORBES, 1928, p. 309 (in part).
Junonia genoveva, HOLLAND, 1931, pl. 20, fig. 9.
Precis zonalis, BATES, 1935, p. 168.
Precis lavinia f. *zonalis*, CARPENTER AND LEWIS, 1943, p. 384.
Precis lavinia f. *genoveva*, CARPENTER AND LEWIS, 1943, p. 384.
Junonia evarete zonalis, COMSTOCK, 1944, p. 454 (in part).
Junonia evarete genoveva, COMSTOCK, 1944, p. 455 (in part).

The extent to which the names for this subspecies have been juggled is evident from the above abbreviated synonymy. No attempt has been made to give a complete bibliography of the mainland populations, but the more important synonymous and distributional references for the West Indies have been included. The names *lavinia* and *genoveva* refer to the nominotypical subspecies from the Guianas and are not correctly applied in the subspecies *zonalis*. For those who wish to recognize varietal names, *constricta* is available for the "dry" form, although it was based on a somewhat intermediate specimen. Typical *zonalis* is of the "wet" form.

West Indian specimens of this subspecies are individually indistinguishable from continental ones. The range of variation on the continent is, however, considerably greater. In particular, a variant with the postmedial fascia solidly suffused with dull orange red is common on the mainland but is rarely if ever seen in the Greater Antilles. The name *incarnata* applies to this form.

The Felders' *zonalis* was described on the basis of material from Bogotá, Colombia, from Cuba, and from Puerto Rico. Since these authors had extensive series from Bogotá, a place from which other *evarete* forms were also described, this may be taken as the type locality of *zonalis*, giving *incarnata* and *constricta*, both from Bogotá, the unequivocal status of varieties.

The life history has been described from Cuba by Dethier and from Jamaica by Swainson. The food plants are given as *Lippia* and "blue vervine." Gundlach records the larva from an undetermined scrophulariaceous plant.

MATERIAL EXAMINED: Three hundred and sixty-six specimens in the American Museum of Natural History, the Carnegie Museum, the Museum of Comparative Zoölogy, the Redpath Museum, and the Cornell University collection, from Cuba, the Isle of Pines, Jamaica, and Hispaniola, and from the following islands in the Bahamas: New Providence, Great Inagua, Watling, Great Abaco, South Eleuthera, and Long. I have also seen a few specimens from southern Florida, while Carpenter and Lewis record what is presumably this subspecies from all three islands of the Cayman group. The subspecies has been taken at altitudes up to 6000 feet but is apparently more common at the lower levels.

***Junonia evarete michaelesi* [Fruhstorfer MS], new subspecies**

- Junonia genoveva*, DOUBLEDAY AND HEWITSON, 1849, p. 209.
Junonia zonalis C. AND R. FELDER, 1867, p. 399 (in part).
Junonia caenia [sic], GODMAN AND SALVIN, 1884, p. 316.
Junonia lavinia, MÖSCHLER, 1889, p. 96.
Junonia lavinia, GUNDLACH, 1891, p. 126.
Junonia caenia [sic], GODMAN AND SALVIN, 1896, p. 515.
Junonia genoveva, SCLATER, 1901, p. 223.
Precis lavinia zonalis, BALLOU, 1913, p. 65.
Junonia coenia, DYAR, 1914, p. 423.
Junonia coenia, WOLCOTT, 1923, p. 141.
Junonia genoveva, WOLCOTT, 1923, p. 141.
Junonia lavinia, WOLCOTT, 1923, p. 141.

- Precis lavinia michaelesi*, TALBOT, 1923, p. 52 (*nomen nudum*).
Junonia lavinia zonalis f. *genoveva*, FORBES, 1928, p. 308 (in part).
Junonia lavinia zonalis, FORBES, 1928, p. 308 (in part).
Junonia lavinia zonalis f. *incarnata*, FORBES, 1928, p. 308 (in part).
Junonia coenia, WOLCOTT, 1936, p. 398.
Junonia genoveva, WOLCOTT, 1936, p. 399.
Junonia lavinia, WOLCOTT, 1936, p. 399.
Precis zonalis, WOLCOTT, 1936, p. 399.
Precis lavinia genoveva, HALL, 1936, p. 276.
Junonia genoveva, WOLCOTT, 1941, p. 122.
Junonia evarete zonalis, COMSTOCK, 1944, p. 454 (in part), pl. 6, fig. 9.
Junonia evarete zonalis f. *incarnata*, COMSTOCK, 1944, p. 455 (in part).
Junonia evarete genoveva, COMSTOCK, 1944, p. 455 (in part), pl. 6, fig. 13, text fig. 8.

The population of *evarete* in Puerto Rico, the Virgin Islands, and the Lesser Antilles as far south as Dominica resembles *zonalis* in most respects. It is immediately distinguishable in the "wet" form, however, by the much larger size of the eye spots on the upper side of the wings. The anterior eye spot of the hind wing is more noticeably enlarged than the others and usually has a diameter about twice that of the posterior eye spot of the same wing. There is considerable individual variation in this character, but in series the difference is striking, and in the material before me individuals can be distinguished with between 80 and 90 per cent accuracy. In the "dry" form the eye spots of the upper side are considerably reduced in size, and the principal distinguishing character is therefore suppressed. I am unable to distinguish the "dry" form of the present subspecies (figured by Comstock as "*genoveva*") from the corresponding form of true *zonalis*. I have not, however, compared long series, and it is possible that minor characters actually exist. The absence of differentiating features in the "dry" form does not greatly affect the practical determinability of the subspecies, for the "dry" form is rare in Puerto Rico and the Virgin Islands and has not been taken at all in the Lesser Antilles north of Grenada. It probably makes up considerably less than 10 per cent of the total population.

The populations of the different islands are not entirely identical. A series from Dominica differs from one from Puerto Rico in that in many specimens the postmedial fascia is largely suffused with orange. The orange suffusion in the Dominican specimens has a pronounced pinkish cast, giving a warmer tint than is seen in the Central American variety

incarnata. This, combined with the large eye spots of the island form, gives a rather different facies, and the name *incarnata* should not be used for the Dominican variant. In addition, specimens from Dominica differ from those from Puerto Rico in having the postmedial fascia considerably narrowed in cell M_2 , although in other characters they present an extreme "wet" facies. Specimens from the Virgin Islands are virtually indistinguishable from those taken in Puerto Rico. In St. Kitts, however, judging from four specimens now in front of me, the orange suffusion and medial constriction are on the average somewhat stronger than in Puerto Rican material, although the general aspect is little altered. Specimens from Guadeloupe approach those from Dominica in appearance, but the tendency to orange suffusion is not so extreme. The characters mentioned are by no means constant in Dominica. Although series from the extreme populations of Puerto Rico on the one hand and Dominica on the other could easily be distinguished, individual specimens can probably not be separated with any degree of accuracy. An extensive series of specimens from the various islands would, I think, show that a cline-like array of populations extends between Puerto Rico and Dominica. I accordingly retain all of these populations under a single name.

South of Dominica the trend is reversed; the eye spots become smaller and the orange suffusion of the postmedial fascia less pronounced. Specimens from St. Lucia are almost exactly intermediate between the Dominican population and true *zonalis* as seen in Trinidad.

I have been unable to trace any validation of Fruhstorfer's name, which is known to me only through the catalogue of types prepared, apparently by Talbot, in connection with the sale of the Fruhstorfer collection. The supposed types are listed as male and female from Puerto Rico, in the Fruhstorfer collection. Assuming that the present description is the first validation of the name *michaelsi*, I do not feel justified in designating the specimens from the Fruhstorfer collection as types of the subspecies, since I have not seen them and have no knowledge of their present whereabouts. Instead, the following type designations are made:

HOLOTYPE: Male, Coamo Springs, Puerto Rico, June 5-7, 1915. This is the specimen figured by Comstock (1944, pl. 6, fig. 9) as "*Junonia evarete zonalis*." The specimen is not be-

fore me as I write, but it was among the material examined by me at the American Museum of Natural History, and from the photograph it appears to be entirely typical of the Puerto Rican population.

ALLOTYPE: Female, Adjuntas, Puerto Rico, February 28, 1927.

PARATYPES: All from Puerto Rico. Two males, "San Tucci" (Santurce), August 5, 7, 1919; two males, one female, Ensenada, June 14-19, 1915; one male, one female, Aibonito, June 1-3, 1915, and July 14-17, 1914; two males, San Juan, February 11-14, 1914; one male, Barros, June 4, 1915; two males, Aguadilla, December 29, 1945 (A. B. Klots); one female, Adjuntas, February 28, 1927; one female, Tortogueros Lake, Manati, November 20, 1925; one female, Manati, June 27-29, 1915; one female, Mayaguez, July 24-29, 1914.

All type material is in the collection of the American Museum of Natural History, and all the type specimens are of the "wet" form.

The following additional specimens have been examined, but are not included in the type series because they were not at hand at the time of writing, or because they came from islands other than Puerto Rico: 216 specimens in the American Museum of Natural History, the Carnegie Museum, the Museum of Comparative Zoölogy, the Redpath Museum, and the Cornell University collection, from Puerto Rico (various localities up to 3000 feet elevation), Vieques, St. Thomas, Tortola, St. John, St. Croix, St. Kitts, Antigua, Guadeloupe, Dominica, St. Lucia, St. Vincent, and Grenada. Material from the last three islands is intermediate to *J. evarete zonalis*.

Junonia evarete evarete (Cramer)

Papilio lavinia CRAMER, 1775, vol. 1, p. 32, pl. 21 (not Fabricius, 1775).

Papilio evarete CRAMER, 1779, vol. 3, p. 18, pl. 203.

Papilio genoveva CRAMER, 1780, vol. 4, pl. 290.

Junonia geneveva [sic], STONER, 1919, p. 177.

Junonia lavinia lavinia f. *genoveva*, FORBES, 1928, p. 316.

As already noted, the population of *evarete* in Barbados has a Guianian facies. Most individuals can be matched in Guianian series, but, judging from the limited material I have seen, the population as a whole shows some peculiar features. Most of the specimens are either of the "dry" form or intermediate,

showing some "dry" characters. Even individuals which are in other respects "wet," having broad wings, an unconstricted postmedial fascia, and prominent ocelli on the hind wings beneath, retain the pale coloration that is characteristic of the "dry" form in Guiana, with the result that the "wet" and "dry" forms are not very sharply distinguishable. The general aspect is that of a pale, tawny, and, as compared with other West Indian populations, an unusually large, form.

The nomenclature of the forms in this subspecies will give some trouble, for the name *lavinia*, which referred to the "wet" form, is invalid. The figure of *evarete* represents an intermediate with a definitely "dry" under side, while *genoveva* is the full "dry" form.

MATERIAL EXAMINED: Twenty-seven specimens, in the American Museum of Natural History, the Redpath Museum, and the Cornell University collections, taken at various localities in Barbados in the months of March, April, June, and September.

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REFERENCES

- BALLOU, H. A.
1913. Notes on insect pests in Antigua. Bull. Ent. Res., vol. 4, pp. 61-65.
- BATES, M.
1935. The butterflies of Cuba. Bull. Mus. Comp. Zool., vol. 78, pp. 71-258.
- CARPENTER, G. D. HALE, AND C. B. LEWIS
1943. A collection of Lepidoptera (Rhopalocera) from the Cayman Islands. Ann. Carnegie Mus., vol. 29, pp. 371-396.
- COMSTOCK, W. P.
1942. *Papilio lavinia*, Fabricius and Cramer. Jour. New York Ent. Soc., vol. 50, pp. 190-191.
1944. Insects of Porto Rico and the Virgin Islands. Scientific Survey of Porto Rico and Virgin Islands, New York Acad. Sci., vol. 12, pp. 421-622, 12 pls.

- CRAMER, P.**
 1775-1784. Papillons exotiques. Amsterdam, vols. 1-4.
- DETHIER, V. G.**
 1941. Metamorphoses of Cuban Nymphalidae and Lycaenidae. Psyche, vol. 48, pp. 70-77, pls. 5, 6.
- DOUBLEDAY, E., AND W. C. HEWITSON**
 1846-1850. The genera of diurnal Lepidoptera. London, vol. 1.
- DYAR, H. G.**
 1914. Lepidoptera of the Yale-Dominican expedition of 1913. Proc. U. S. Natl. Mus., vol. 47, pp. 422-436.
- ELIOT, N.**
 1949. The significance of the wing pattern of *Precis* (Nymphalidae) in America. Entomologist, vol. 82, pp. 176-184.
- FABRICIUS, J.**
 1775. Systema entomologiae. Flensburg.
- FELDER, C., AND R. FELDER**
 1864-1867. Reise der österreichischen Fregatte Novara um die Erde. Vienna, vol. 1.
- FORBES, W. T. M.**
 1928. Variation in *Junonia lavinia* (Lepidoptera, Nymphalidae). Jour. New York Ent. Soc., vol. 36, pp. 305-320, pl. 11.
 1947. Buckeyes and Wegener. Entomologist, vol. 80, pp. 56-58.
- Fox, W. J., AND C. W. JOHNSON**
 1893. List of Lepidoptera from Jamaica, W. I. Ent. News, vol. 4, p. 3.
- GODMAN, F. D., AND O. SALVIN**
 1884. List of Rhopalocera collected by G. F. Angas in the island of Dominica. Proc. Zool. Soc. London, pp. 314-326, pl. 25.
 1896. On the butterflies of St. Vincent, Grenada, and the adjoining islands of the West Indies. *Ibid.*, pp. 513-520.
- GUNDLACH, J.**
 1881. Contribucion á la entomología cubana. Havana, vol. 1, lepidópteros.
 1891. Apuntes para la fauna puerto-riqueña—lepidópteros. Ann. Soc. Española Hist. Nat., vol. 20, pp. 411-572.
- HALL, A.**
 1925. List of the butterflies of Hispaniola. Entomologist, vol. 58, pp. 161-165, 171-174.
 1936. The butterflies of St. Kitts. *Ibid.*, vol. 69, pp. 274-278.
- HOLLAND, W. J.**
 1898. The butterfly book. New York.
 1916. The Lepidoptera of the Isle of Pines. Ann. Carnegie Mus., vol. 10, pp. 487-518, pl. 31.
 1931. The butterfly book. Second and revised edition. New York.
- HÜBNER, J.**
 1806-1838. Sammlung exotischer Schmetterlinge. Augsburg.
- KAYE, W. J.**
 1926. The butterflies of Jamaica. Trans. Ent. Soc. London, year 1925, pp. 455-504.
- LICHY, R.**
 1943. Documents pour servir à l'étude des lépidoptères de la faune améri-

- caine. (Ière note.) Sur le dimorphisme saisonnier chez deux *Terias* (Lépid., Rhopal., Pieridae). *Bol. Ent. Venezuela*, vol. 2, pp. 175-184.
- LONGSTAFF, G. B.
1908. Notes on some butterflies taken in Jamaica. *Trans. Ent. Soc. London*, pp. 37-51.
- LUCAS, P. H.
1857. Lépidoptères. *In de la Sagra, R., Histoire physique . . . de l'île de Cuba. Animaux articulés.* Paris.
- MÖSCHLER, H. B.
1886. Beiträge zur Schmetterlings-fauna von Jamaica. *Abhandl. Senckenberger Naturf. Gesellsch.*, vol. 14, pp. 25-84, 1 pl.
1889. Die lepidopteren-fauna der Insel Portorico. *Ibid.*, vol. 16, pp. 69-360, pl. 1.
- MUNROE, E. G.
1949. Some remarks on the *orithya* group of the genus *Junonia* (Lep., Nymphalidae). *Entomologist*, vol. 82, pp. 157-158.
- POEV, F.
1851-1854. *Memorias sobre la historia natural de la isla de Cuba.* Havana.
- SCLATER, P. L.
1901. [Untitled note on the Lepidoptera of St. Lucia, West Indies.] *Proc. Zool. Soc. London*, year 1901, vol. 1, p. 223.
- SEITZ, A.
1913-1920. Nymphalidae [in part] and Erycinidae. *In Seitz, A., Macro-lepidoptera of the world, fauna exotica: Americana.* Stuttgart, vol. 5.
- STONER, D.
1919. Collecting terrestrial arthropods in Barbados and Antigua, British West Indies. *Canadian Ent.*, vol. 51, pp. 173-178, 217-220.
- SWAINSON, E. M.
1901. Notes on lepidopterous larvae from Jamaica. *Jour. New York Ent. Soc.*, vol. 9, pp. 77-81.
- TALBOT, G.
[1923?] The Fruhstorfer collection of butterflies. Catalogue of types with general account and list of the more interesting forms. Nice.
- WOLCOTT, G. N.
1923. *Insectae Portoricensis.* *Jour. Dept. Agr. Porto Rico*, vol. 7, pp. 1-312.
1936. *Insectae Borinquensis.* *Jour. Agr. Univ. Porto Rico*, vol. 20, pp. 1-627.
1941. A supplement to "Insectae Borinquensis." *Ibid.*, vol. 25, pp. 33-158